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## **Section 03300 CAST-IN-PLACE CONCRETE**

### **PART 1 - GENERAL**

#### **1.01-Scope**

**1.01.1**-These specifications cover cast-in-place concrete for use in buildings, sidewalks, curb and gutters, foundations, and other related items.

**1.01.2**-The following subjects are considered outside of the scope of these specifications:

1. Precast concrete products.
2. Heavy duty paving concrete
3. Terrazzo
4. Insulating Concrete
5. Lightweight concrete

**1.02-Americans with Disabilities Act**-All concrete structures shall be designed and constructed to meet the requirements of the U.S. Department of Justice, Americans with Disabilities Act, Rev. July >97. This law requires that all new places of public accommodations and commercial facilities be designed for persons with disabilities. Required guidelines for curb ramps and other handicapped related structures shall be as specified in U.S. Department of Justice, ADA Design Guide.

**1.03-Design of Concrete Structures** shall be performed and stamped by a Professional Engineer registered in the State of Georgia. In no instance shall a concrete sidewalk be less than 4" thick nor a driveway less than 6" thick. The Engineer shall refer to City of Savannah Standard Construction Details for minimum design requirements of various structures.

**1.04-Construction Loads** Construction loads shall not exceed what the member is able to carry safely and without damage. The Contractor is responsible for providing all supplemental support necessary to protect the structure until the concrete has reached it's specified design strength.

#### **1.05-Referenced Standards and Specifications**

**1.05.1**-The most recent issue of each standard or specification shall be used. The following abbreviations may be used to reference the publishing organization:

ACI - American Concrete Institute, P.O. Box 9094,  
Farmington Hills, MI 48333-9094.

ASTM - American Society for Testing and Materials,  
100 Barr Harbor Drive, P. O. Box C700, West  
Conshohocken, PA 19428-2959.

AASHTO - American Association of State Highway and  
Transportation Officials 444 North Capital  
Street, N.W., Suite 225, Washington DC 20001

CRSI - Concrete Reinforcing Steel Institute, 933  
North Plum Grove Road, Schaumburg, IL 60173.

## **PART 2 - MATERIALS FOR CONCRETE**

### **2.01-Cements**

Portland cement shall conform to ASTM C 150. Portland blast furnace slag cement or portland pozzolan cement shall conform to ASTM C 595.

### **2.02-Admixtures**

**2.02.1-Admixtures** to be used in concrete, when required or permitted, shall conform to the following appropriate specifications:

**2.02.1.1-Air-entraining admixtures**, ASTM C 260

**2.02.1.2-Water-reducing, retarding, and accelerating admixtures**, ASTM C494

**2.02.1.3-Pozzolanic admixtures**, ASTM C 618

**2.02.1.4-Fiber reinforcement:** fiber reinforcement shall be 1/2" or 3/4" collated, fibrillated polypropylene fibers meeting the requirements of ASTM C 1116, para. 4.1.3, Type III.

**2.02.1.5-Admixtures** used in the work shall be of the same composition as those used in establishing the concrete proportions.

### **2.03- Water**

Mixing water for concrete shall meet requirements of ASTM C 94.

### **2.04-Aggregates**

**2.04.1-Aggregates** for normal weight concrete shall meet the requirements for ASTM C 33 unless otherwise specified.

**2.04.2**—Fine and coarse aggregates shall be regarded as separate ingredients. Each size of coarse aggregate, as well as the combination of sizes when two or more are used, shall meet the appropriate grading requirements of the applicable ASTM specifications.

### **PART 3 - PROPORTIONING**

**3.01— General** Concrete for all parts of the work shall be of the specified quality and capable of being placed without excessive segregation. When hardened, concrete shall develop all characteristics required by these specifications and the contract documents.

**3.02—Strength** The specified compressive strength of the concrete (**f'c**) for each portion of sidewalks and curb and gutters shall be a minimum of 3000 psi unless a greater strength requirement is indicated on the contract drawings or herein. Driveway and road paving shall have a compressive strength of not less than 5000 psi. Strength requirements shall be based on 28-day compressive strength unless a different test age is specified. The compressive strength of the concrete shall be determined by ASTM C39.

### **3.03—Durability**

**3.03.1**—Concrete shall be air entrained and shall conform to the air content limits of ACI 301-99 Table 4.2.2.4.

**3.03.2**—The water-cement ratio shall not exceed 0.53 by weight.

**3.03.3**—For all concrete in which aluminum or galvanized metal is to be embedded, it shall be demonstrated by test that the mixing water of the concrete, including that contributed by the aggregates and any admixture used, will not contain a deleterious amount of chloride ion.

**3.04—Slump** The concrete shall be proportioned and produced to have a slump of 4 inches or less. A tolerance of up to 1 inch above the maximum indicated shall be allowed for one batch in any five consecutive batches tested. The slump shall be determined by ASTM C 143.

**3.05—Maximum size of coarse aggregate** The nominal size of the aggregate shall not be more than one-fifth of the narrowest dimension between sides of forms, one-third of the depth of slabs, nor three-fourths of the minimum clear spacing between

reinforcing bars. See ASTM C 33 for tolerance on oversize for various nominal maximum size designations.

### **3.06- Admixtures**

**3.06.1**-The amount of calcium chloride shall not exceed 2 percent by weight of cement. The amount of calcium chloride shall be determined by the method of described in AASHTO T260.

**3.06.2**-For all concrete which will remain in contact with aluminum or galvanized metal, the limitation of Section 3.3.3 shall apply unless protective measures acceptable to the Engineer are provided.

**3.06.3**-All admixtures shall be used in accordance with the manufacturer's instructions except as otherwise specified.

**3.06.4**-Where fiber reinforcement is called for, it shall be added to the concrete in the manner and rate recommended by the manufacturer. Unless otherwise prohibited by the manufacturer, the minimum rate of application shall be 1 lb. of polypropylene fibers per cubic yard of concrete.

**3.06.5**-In the Historic District, a color additive equal to Lambert #4685 shall be added to all concrete sidewalks at the rate of 2 2 pounds per cubic yard in order to match the color of existing sidewalks.

**3.07- Mix Design** The Contractor shall **submit** proposed concrete mix designs for each type of concrete in the project. Proposed concrete proportions shall be subject to acceptance by the Engineer based on demonstrated ability to produce concrete meeting all requirements of the specifications. Concrete proportions shall be established on the basis of previous field experience as specified in ACI 301, Section 4.2.3 with materials to be employed in the work; or if field test results are not available, select the required test strength from Table 4.2.2.3.b of ACI 301-99. Contractor is not authorized to batch any concrete for use in this project until mix design has been approved by the Engineer.

## **PART 4 - FORM WORK**

**4.01-Form Work General** Forms shall have sufficient strength to withstand the pressure resulting from placement and vibration of the concrete, and shall have sufficient rigidity to maintain

specified tolerances. The design and engineering of the formwork, as well as its construction, shall be the responsibility of the **Contractor**.

**4.02-Earth as Forms** Earth cuts shall not be used as forms for vertical surfaces unless specifically allowed by the Engineer.

The Contractor is responsible for ensuring that all earth cuts meet OSHA trenching regulations.

**4.03-Form Release** Before placing the reinforcing steel or the concrete, the surfaces of the forms shall be covered with an acceptable coating material that will effectively prevent absorption of moisture, prevent bond with the concrete, and not stain the concrete surfaces.

**4.04-Form Removal** Under no circumstances shall formwork be removed prior to 24 hours after placement of concrete.

**4.05-Formwork Tolerances** for formed surfaces shall be in compliance with ACI 117.

**4.06-ACI Formwork Standards Adherence** Unless otherwise specified, formwork shall meet the requirements of ACI 301-99, Chapter 2.

## **PART 5 - REINFORCEMENT**

**5.01- Reinforcing Bars** shall be deformed except spirals, which may be plain bars. Reinforcing bars shall be Grade 60 conforming to one of the following specifications: ASTM A 615, ASTM A 616(including supplementary requirement S1), ASTM A 617, ASTM A 706. If called for on plans, reinforcing bars shall be epoxy-coated in accordance with ASTM A775

**5.02-Welded Wire Fabric** shall be fabricated from smooth or deformed wire and shall conform to the wire size and wire spacing required or indicated on the contract drawings. Welded wire fabric shall conform to one of the following specifications:

- ASTM A 185, except welded intersections shall be spaced not farther apart than 12 inches in the direction of the principal reinforcement.
- ASTM A 497, except welded intersections shall be spaced not farther apart than 16 inches in the direction of the principal reinforcement.

**5.03-Bar Supports**

**5.03.1**—Wire bar supports shall be in accordance with Class 1, maximum protection, or Class 2, moderate protection in Chapter 3 of the CRSI Manual of Standard Practice.

**5.03.2**—Precast concrete brick bar supports may used to support rebar mats or welded wire mesh in slab-on-grade construction.

**5.04—Welding** of reinforcing bars or welded wire fabric is specifically **prohibited**.

**5.05—Fabrication** of reinforcing bars shall be in accordance with the standard fabricating tolerances in ACI 117.

#### **5.06—Placing Reinforcement**

**5.06.1**—Reinforcement shall be placed within the tolerances specified in ACI 117 and guidelines specified in ACI 301 Section 3.3 Minimum concrete cover for reinforcement shall be as required in Table 3.3.2.3 of ACI 301.

**5.06.2**—Field bending of bars partially embedded in concrete shall not be permitted unless specifically accepted by the Engineer.

**5.07—Sidewalks** shall be reinforced by one of the following methods:

**5.07.1**—Welded wire mesh located 2" from the top surface of the concrete. Minimum size of mesh shall be 6"x6" - W2.9 x W2.9.

**5.07.2**—Concrete shall be fiber reinforced.

**5.07.3**—Deformed reinforcing bars providing no less than 0.25 square inches per foot (each way).

### **PART 6 - JOINTS AND EMBEDDED ITEMS**

**6.01—Construction Joints** shall be located and detailed on the contract drawings. Unless otherwise indicated on the drawings, all reinforcement shall be continued across the joints.

#### **6.02— Contraction Joints**

**6.02.1**—Sawcut joints shall be located and detailed as indicated on the contract drawings. Cutting shall be



timed properly with the set of concrete. Cutting shall be started as soon as the concrete has hardened sufficiently to prevent aggregates being dislodged by the saw. Cutting shall be completed before shrinkage stresses become sufficient to produce cracking.

**6.02.2**—Tooled Control Joints in sidewalks shall be provided at a spacing not greater than 10 feet on center or twice the width along it's length.

### **6.03—Expansion Joints**

**6.03.1**—Expansion joints shall be located as shown on the contract drawings but shall be spaced no further apart than 80 feet along a sidewalk or curb and gutter.

**6.03.2**—Reinforcement or other embedded metal items bonded to the concrete (except dowels in floors bonded on only one side of joints) shall not be permitted to extend continuously through any expansion joint.

**6.03.3**—Premolded expansion joint filler shall conform to one of the following specification: ASTM D 994, ASTM D 1751, or ASTM D 1752.

**6.04—Joint Sealant** All expansion joints shall be sealed per detail on project drawings. Other joints to be sealed will be indicated on the project drawings. Joint sealant shall meet the requirements of ASTM C 920, Type S or M, Grade P, Class 25.

**6.05—Curb and Gutter** sections shall be constructed in sections of uniform length not to exceed 10 feet in length or be less than 5 feet in length. If slip-form or extruded construction is used, contraction joints shall be located at intervals no greater than 10 feet by sawing the hardened concrete at the proper time. The depth of the saw-cut shall be one-fourth of the thickness of the curb and gutter section. The maximum width of the cut shall be 1/4 inch and shall be sawed no later than 24 hours after the pour.

## **PART 7 – PRODUCTION OF CONCRETE**

**7.01—Ready-mixed concrete** shall be batched, mixed and transported in accordance with ASTM C 94, except as otherwise provided in this chapter. Plant equipment and facilities shall conform to "Certification of Ready Mixed Concrete Production Facilities" of the National Ready Mixed Concrete Association.

**7.02—Concrete produced by on-site** volumetric batching and continuous mixing shall be batched and mixed in accordance with

and shall conform to all requirements of ASTM C 685.

## **PART 8 - PLACING OF CONCRETE**

### **8.01 Preparation**

**8.01.1**—Form work shall be completed; snow, ice and water shall be removed; reinforcement shall be secured in place; expansion joint material, anchors, and other embedded items shall be positioned; and the entire preparation shall be accepted by the Engineer or his representative prior to placing concrete.

**8.01.2**—The subgrade shall be well drained and of adequate and uniform load bearing capacity. The minimum in-place density of the subgrade soils shall be as required in the specifications.

**8.01.3**—Concrete shall not be placed on frozen ground. The subgrade shall be free of frost before concrete placing begins. If the temperature inside a building where concrete is to be placed is below freezing it shall be raised and maintained above 50 F long enough to remove all frost from the subgrade.

**8.01.4**—Subgrades shall be moist at the time of concreting. If necessary, they shall be dampened with water in advance of concreting, but there shall be no standing water on the subgrade nor any muddy or soft spots when the concrete is placed.

### **8.02—Conveying and Placing**

**8.02.1**—Concrete shall be handled from the mixer to the place of final deposit as rapidly as practicable by methods which will prevent segregation or loss of ingredients and in a manner which will assure that the required quality of the concrete is maintained.

**8.02.2**—The loss of slump in pumping or pneumatic conveying equipment shall not exceed 2 inches. Concrete shall not be conveyed through pipe made of aluminum or aluminum alloy.

**8.02.3**—Concrete shall be deposited continuously, or in layers of such thickness that no concrete will be deposited which has hardened sufficiently to cause the formation of seams or planes of weakness within the

section. If a section cannot be placed continuously, construction joints shall be located as indicated on the contract documents or as permitted by the Engineer. Placing shall be carried on at such a rate that the concrete which is being integrated with fresh concrete is still plastic. Concrete which has partially hardened or has been contaminated by foreign materials shall not be deposited. Temporary spreaders in forms shall be removed which the concrete placing has reached an elevation rendering their service unnecessary. They may remain embedded in the concrete only if made of metal or concrete and if prior acceptance has been obtained by the Engineer.

**8.02.4**—Concrete shall be deposited as nearly as possible in its final position to avoid segregation due to rehandling or flowing. Concrete shall not be subjected to any procedure which will cause segregation.

**8.02.5**—All concrete shall be consolidated by vibration, spading, rodding or forking so that the concrete is thoroughly worked around the reinforcement, around embedded items, and into corners of forms, eliminating all air or stone pockets which may cause honeycombing, pitting, or planes of weakness. Use of vibrators to transport concrete within forms shall not be allowed. A spare vibrator shall be kept on the job site during all concrete placing operations.

**8.02.6**—Unless adequate protection is provided and acceptance is obtained from the Engineer, concrete shall not be placed during rain, sleet, or snow.

**8.02.7**— Except as below, the temperature of the plastic concrete, as placed, shall be no lower than 55 F and no higher than 90 F. The air temperature shall be **at least 35 degrees F** and rising when concrete is mixed and placed. When the average of the highest and lowest temperature during the period from midnight to midnight is expected to drop below 40 degrees F for more than three successive days, deliver concrete to meet the requirements of Table 4.2.2.7 of ACI 301-99.

**8.02.8 - Protection.** Immediately after placement protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury. Protection measures shall conform to Section 5.3.6.5 and 4.2.2.7 of ACI 301-99.

## **PART 9 - REPAIR AND REPLACEMENT**

**9.01-Repair of Surface Defects:** All honeycombed and other defective concrete shall be removed down to sound concrete and patched. When chipping away loose or defective material, no featheredging will be permitted.

**9.02-Tie holes** shall be plugged with patching mortar unless stainless steel, noncorrosive, or acceptably coated ties are used.

**9.03-Saw Cuts** Where a portion of an existing concrete driveway or sidewalk is removed, the existing section shall be cut to a minimum depth of 4-inches with a suitable saw prior to breaking out pavement.

## **PART 10 - SURFACE FINISHES**

**10.01-Formed Surfaces** of concrete shall be given the finishes specified below unless the contract documents specify otherwise:

Rough form finish - For all concrete surfaces not exposed to public view

Smooth form finish - For all concrete surfaces exposed to public view.

Public View - Defined as any surface of the finished concrete that may be seen by a person without excavating soil.

**10.01.1-Rough form finish** - No selected form facing materials shall be specified for rough form finish surfaces. Tie holes and defects shall be patched. Fins exceeding 1/4 in. in height shall be chipped off or rubbed off. Otherwise, surfaces shall be left with texture imparted by the forms.

**10.01.2-Smooth form finish** - The form facing material shall produce a smooth, hard, uniform texture on the concrete. The arrangement of the facing material shall be orderly and symmetrical, with the number of seams kept to the practical minimum. It shall be supported by studs or other backing capable of preventing excessive deflection. Materials with raised grain, torn surfaces, worn edges, patches, dents, or other defects which will impair the texture of the concrete surface shall not be used. All fins shall be completely removed. No later

than the day following form removal, the concrete surfaces shall be wetted and rubbed with carborundum brick or other abrasive until uniform color and texture are produced.

**10.01.3-** Tops of walls or buttresses, horizontal offsets, and similar unformed surfaces occurring adjacent to formed surfaces shall be struck smooth after concrete is placed and shall be floated to a texture reasonably consistent with that of the formed surfaces. Final treatment on formed surfaces shall continue uniformly across the unformed surfaces.

## **10.02- Slab Finishes**

Unless otherwise specified on the contract documents, the following finishes shall be used as applicable:

Broom or belt finish - For sidewalks and garage floors and ramps.

Floated Finish - For surfaces intended to receive roofing, waterproofing membranes, or sand bed terrazzo.

Troweled finish - For floor intended as walking surfaces or for reception of floor coverings.

Non-solid finish - For exterior platforms, steps, and landings; and for exterior and interior pedestrian ramps.

**10.02.1-** Floated Finish: After the concrete has been placed, consolidated, struck off, and leveled, the concrete shall not be worked further until ready for floating. Floating with a hand float or with a bladed power trowel equipped with float shoes, or with a powered disc float shall begin when the water sheen has disappeared and when the surface has stiffened sufficiently to permit the operation. All high spots shall be cut down and all low spots filled during this procedure. The slab shall then be refloated immediately to a uniform sandy texture.

**10.02.2-** Troweled finish: The surface shall first be float-finished as specified in Section 10.2.1. It shall next be power troweled, and finally hand troweled. The first troweling after power floating shall produce a smooth surface which is relatively free of defects but which may still show some trowel marks. Additional troweling shall be done by hand after the surface has

hardened sufficiently. The final troweling shall be done when a ringing sound is produced as the trowel is moved over the surface. The surface shall be thoroughly consolidated by the hand troweling operations. The finished surface shall be essentially free of trowel marks, uniform in texture and appearance and shall be plane to required tolerances.

**10.02.3-** Broom or belt finish: Immediately after the concrete has received a float finish as specified in Section 10.2.1, it shall be given a coarse transverse scored texture by drawing a broom or burlap belt across the surface.

**10.02.4-** Non-slip finish: Crushed ceramically bonded aluminum oxide or other specified selected abrasive particles shall be blended with Portland cement in the proportions recommended by the manufacturer of the aggregate. The surface shall be given a float finish in accordance with Section 10.2.1. Approximately two-thirds of the blended material for required coverage shall be applied to the surface by method that insures even coverage without segregation. Floating shall begin immediately after application of the first "dry shake". After this material has been embedded by floating, the remainder the blended material shall be applied to the surface at right angles to the previous application. A second floating shall follow immediately. The rate of application of such material shall be not less than 25 lb. per 100 square feet.

**10.02.5-** Slab finishing tolerances: Unless otherwise called out in the contract documents, finishes shall be true planes within 1/4 inch in 10 feet as determined by a 10-ft. straightedge placed anywhere on the slab in any direction. The maximum variation in elevation for a level slab shall not exceed 3/4 inches over the entire slab.

## **PART 11 - CURING AND PROTECTION**

**11.01- General:** Beginning immediately after placement, concrete shall be protected from premature drying, excessively hot or cold temperatures, and mechanical injury, and shall be maintained with minimal moisture loss at a relatively constant temperature for the period necessary for hydration of the cement and hardening of the concrete.

### **11.02- Preservation of Moisture**

**11.02.1-** For concrete surfaces not in contact with forms, one of the following procedures shall be applied immediately after completion of placement and finishing:

**11.02.1.1-** Ponding or continuous sprinkling.

**11.02.1.2-** Application of absorptive mats of fabric kept continuously wet.

**11.02.1.3-** Application of waterproof sheet materials conforming to ASTM C 171.

**11.02.1.4-** Application of a curing compound conforming to ASTM C309 in accordance with manufacturer's recommendation. It shall not be used on any surface against which additional concrete or other material is to be bonded unless it is proven that the curing compound will not prevent bond.

**11.02.2-** Moisture loss from surfaces placed against wooden forms or metal forms exposed to heating by the sun shall be minimized by keeping the forms wet until they can be safely removed. After form removal the concrete shall be cured until the end of the time prescribed in Section 11.2.3 by one of the above methods.

**11.02.3-** Curing in accordance with the above requirements shall be continued for at least 7 days in the case of all concrete except high-early strength concrete for which the period shall be at least 3 days.

**11.03- Temperature Control.** When the mean daily outdoor temperature is less than 40 F, the temperature of the concrete shall be maintained between 50 and 70 F for the required curing period of Section 11.2.3. Combustion heaters shall not be used during the first 24 hours unless precautions are taken to prevent exposure of the concrete to exhaust gases which contain carbon dioxide.

## **PART 12 - TESTING**

**12.01- Owner Paid Testing.** Field sampling and testing shall be performed by an independent testing lab hired and paid for by the Owner. Samples of concrete shall be taken at random locations and at such times to represent the quality of the materials and work throughout the project. The laboratory shall provide the necessary labor, materials, equipment, and

facilities for sampling the concrete and for casting, handling and storing the concrete samples at the site of work. Sampling of plastic concrete will be in accordance with ASTM C172. Samples for pumped concrete shall be taken at the hose discharge point. Samples for other concrete shall be taken at the hopper of concreting equipment or transit mix truck.

**12.02-Contractor Paid Testing** The Contractor shall pay for the following services when required:

**12.02.1-** All testing, test results, or certifications required to verify that a proposed material item or mix design meets the requirements of the specifications.

**12.02.2-** Additional testing and inspection required because of changes in materials or proportions requested by the Contractor.

**12.02.3-** Additional testing of materials or concrete occasioned by their failure by test or inspection to meet specification requirements. For example, if compressive test results indicate concrete in place may not meet structural requirements, tests shall be made to determine if the structure or portion thereof is structurally sound. Tests may include, but not be limited to, cores in accordance with ASTM C 42 and any other load tests acceptable to the Engineer. Costs of such tests will be borne by the Contractor.

**12.03-Test Scheduling** To facilitate testing and inspection, the Contractor shall advise the Owner and the designated testing agency sufficiently in advance of operations to allow for the assignment of personnel and for the completion of quality tests and inspection of forms.

#### **12.04-Strength Tests**

**12.04.1-General:** The strength of the concrete will be verified by the testing laboratory during placement of the concrete. Verification shall be accomplished by testing standard cylinders of concrete samples taken at the job site.

**12.04.2-Frequency:** As a minimum, one set of four standard cylinders shall be cast of each class of concrete based on the most stringent of the following requirements as applicable:

- For each 50 cubic yards or less
- For each 100 feet of sidewalk
- For each 200 feet of curb and gutter



- For each 4000 square feet of surface area
- For each day a pour is made

**12.04.3-Lab testing:** Testing of specimens for compressive strength shall be in accordance with ASTM C39. Tests shall be made at 7 and 28 days from time of casting. Two test cylinders from each group of four shall be tested at the end of 7 days and two shall be tested at the end of 28 days. Each strength test result shall be the average of the strengths of two test cylinders (cast from material taken from a single load of concrete) at 28 days.

**12.04.4-Acceptance of Concrete Strength:** The strength level of the concrete will be considered satisfactory so long as the average of all sets of three consecutive strength results equal or exceed the specified strength **f'c** and not more than 10% of the strength test results shall have values less than this value. No individual strength test shall be less than the specified strength **f'c** by more than 500 psi.

**12.05-Slump Tests:** The slump shall be as specified when measured in accordance with ASTM C 143. Samples for slump determination shall be taken from the concrete during placing. Tests shall be made at the beginning of concrete placing operations and at subsequent intervals to insure that the specification requirements are met. When concrete is pumped, slump tests shall be taken from concrete at the discharge end of the pump hose. Slump tests shall also be performed whenever standard cylinders are cast.

**12.06-Temperature and Air Content Tests:** Temperature tests shall be made at frequent intervals during hot or cold weather conditions until satisfactory temperature control is established. Whenever standard cylinders are cast, temperature tests shall be performed. Air content tests shall be in accordance with ASTM C 231 and shall be measured whenever standard cylinders are cast.

### **PART 13 - FLOWABLE FILL**

The mixture of dry material per cubic yard shall be 50 pounds cement, 600 pounds fly-ash, and 2,500 pounds sand. Depending on the slump requested for the specific job, water added shall be 65 gallons (541 pounds) for a 6-inch slump, to 55 gallons (458 pounds) for a 3-inch slump. One cubic yard of 6-inch slump will contain more than 27 cubic feet due to the additional water. Unconfined compressive strength will be 80 psi at 7 days and 150 psi at 28 days.

#### **PART 14 - GROUT-FILLED FABRIC MAT**

Grout-filled fabric mat (revetment) shall be one of the following:

- 1 HYDROTEX™ Filter Point Forms (FP400) as manufactured by Hydrotex Synthetics, Inc.; 74 Perimeter Center East, Suite 7420; Atlanta, Georgia 30346-1803, Tel: 1-800-225-0023; or
- 2 Fabriform Filter Point (8" FP) as manufactured by Construction Techniques, Inc., P.O. Box 360007, Cleveland, OH 44136, Tel: 1-800-563-5047; or
- 3 **Owner**-approved equivalent.

The **Contractor** shall adhere to all recommendations published in the respective manufacturer's Construction & Quality Control Manual or similar publication.

**END OF SECTION 03300**